grandfather of the present proprietor, and coco-nut planting was progressing. Since then most of the available ground has been cleared of other vegetation and planted with coco-nut trees, so that the wild vegetation is nearly limited to an external fringe, and this often broken. In North Keeling, about fourteen miles distant from the main group, which was not visited either by Darwin or Forbes, there was still sufficient of the original vegetation left for Dr. Guppy to form an idea of what it was generally before it was cleared away for cultivation. Darwin's investigations had the effect of arousing the interest of Captain Ross in the natural history of the group, and this interest has been inherited by his descendants, who have greatly aided subsequent travellers by their hospitality and by their knowledge of local phenomena. Darwin collected or noted about a score of different species of wild plants, and this number has now been doubled by Forbes and Guppy.

This brings us to the results of Guppy's own investigations, the most interesting and important being those relating to the capabilities of certain plants, notably the coco-nut, to establish themselves on coral islands, as some writers of repute have strongly contested the possibility of it, and there can be little doubt that the coco-nut and other plants having large seeds obtain a footing only under exceptional circumstances, such as being buried by the sands washed over them in heavy gales.

Foreign coco-nuts are frequently cast ashore on the Keeling Islands, where they sometimes germinate, but the crabs invariably destroy the sprouting nut. Suppose, however, a period when crabs were less numerous, and the chances are not so very remote of some of the growing nuts escaping them. Again, Mr. Forbes cites an instance in which the crabs may even facilitate the establishment of the coco-nut, for he observed that the crabs sometimes burrow so near the surface that the nuts occasionally break through and find favourable conditions for growth. Should they escape the crabs in their earliest infancy, they are safe. Many other plants are now prevented by the crabs from establishing themselves on the Keeling Islands. Dr. Guppy says:—

"I have been informed by the proprietor that sometimes when a large amount of vegetable drift has been stranded on the beach, a line of sprouting plants may be shortly observed just above the usual high-tide mark; but the tender shoots are soon eaten by the crabs, and in a little time every plant is gone. Many of the seeds that germinate on the beach are beans, varying in size from those of *Entada scandens* downward. They form one-third of the vegetable drift."

Indeed, the crabs are so numerous that Mr. Ross has failed in many attempts to raise plants of some of these things in his garden. One flourishing *Entada scandens* and a sickly *Calophyllum Inophyllum* were all the reward of much trouble in this direction. The huge square fruits of *Barringtonia speciosa* are often thrown up, and the seed germinates, but very few escape the crabs. This tree had not established itself in North Keeling, though in August 1888, Dr. Guppy observed two seedlings about eighteen inches high, and they owed their preservation, it was supposed, to the circumstance of the fruits having been concealed when the seeds germinated by the bed of fine drift pumice that had been deposited on the shores of the lagoon after the Krakata͠o eruption.

Particulars are given of the incipient germination and early destruction of *Carapa*, *Nipa*, *Cycas*, and other seeds. Of course, the clearing of the original vegetation and subsequent cultivation, and the incidental or intentional introduction of various birds and animals, and the migration of the myriads of sea-birds that formerly inhabited the islands must all be taken into consideration. Yet no species of plant ever known to grow wild there has become quite extinct, an evidence of their tenacity of life under unfavourable conditions.

Dr. Guppy's additions to the Keeling flora include the following plants, which he regards as having formed part of the original vegetation, judging from the conditions under which he found them: *Calophyllum Inophyllum*, *Thespesia populnea*, *Triumfetta subpalmata*, *Suriana maritima*, *Canavalia obtusifolia*, *Terminalia Catappa*, *Barringtonia speciosa*, *Sesuvium Portulacastrum*, *Ipomœa grandiflora*, *I. biloba* (*I. pes-capræ*), *Premna obtusifolia*, and *Hernandia peltata*. Their general distribution fully justifies this deduction.

The experiments on the vitality of seeds after forty to fifty days in sea-water were necessarily of a limited character, but they established the fact that the following germinated: *Cordia subcordata*, *Hernandia peltata*, *Guettarda speciosa*, *Thespesia populnea*, *Scævola Kœnigii*, *Morinda citrifolia*, and *Tournefortia argentea*. Every seed of the last named germinated after forty days', and half of the seeds of *Morinda* after fifty-three days' immersion. Dr. Guppy calculates that a surface current of only one knot an hour would convey drift a distance of 1000 to 1200 miles during these periods. From the fact that almost all the drift is thrown up on the eastern and southern coasts, it is assumed that the bulk of it comes from the Malay Archipelago, and perhaps some from the north-west coast of Australia. This is borne out by the general distribution of the established Keeling plants, as well as by the other seeds and fruits that are stranded there.

Among the latter may be mentioned *Pangium edule*, *Heritiera littoralis*, *Erythrina indica*, *Mucuna* spp., *Dioclea reflexa*, *Cæsalpinia Bonducella*, *Cerbera Odollam*, *Quercus* spp., and *Caryota*.

Carpophagous pigeons have played no recognizable part in the flora of the Keeling Islands.

In his forthcoming book Dr. Guppy will doubtless give all the details of his observations in a more connected and systematic form.

W. BOTTING HEMSLEY.

NOTES.

TO-DAY the honorary freedom and livery of the Turners Company are to be conferred on Sir John Fowler, K.C.M.G., and Sir Benjamin Baker, K.C.M.G., "in recognition of their distinction and eminence as engineers, earned by many great works at home and abroad, especially the design and construction of the Forth Bridge, one of the greatest triumphs of British engineering in the Victorian age."

SIR JOHN KIRK, F.R.S., AND SIR WILLIAM TURNER, F.R.S., Professor of Anatomy in the University of Edinburgh, have been elected members of the Athenæum Club, under the rule which provides for the annual election of a certain number of persons of distinguished eminence in science, literature, or the arts, or for public services.

MR. T. KIRKE ROSE, Associate of the Royal School of Mines, has obtained the appointment of Assistant Assayer at the Royal Mint, by competition among selected candidates. It is a post of some importance, and the salary rises from £350 to £450, with an official residence in the Mint. After an unusually brilliant career at the Royal School of Mines, Mr. Rose was engaged as metallurgist and assayer to the Colorado Gold and Silver Extraction Company in Denver. It is to be hoped that he will afford valuable assistance to Prof. Roberts-Austen in preserving the standard fineness of our coinage with the remarkable degree of accuracy that generations of assay masters have attained.

SIR HENRY ROSCOE has introduced into the House of Commons a Technical Education Bill, which is intended to clear up any doubt as to the legality of the provision of technical and manual instruction in public elementary schools. The following are the provisions of the measure:—(1) The managers of any public elementary school may provide technical or manual instruction for the scholars in that school, either on the school premises or in any other place approved by the inspector, and attendance by the scholars of the school at such instruction shall be deemed to be attendance at the public elementary school. (2) The conditions on which Parliamentary grants shall be made in aid of technical or manual instruction in public elementary schools, shall be those contained in the Minutes of the Education Department and of the Science and Art Department in force for the time being. (3) The expression "technical instruction" and "manual instruction" shall have the same meaning as in the Technical Instruction Act (1889).

LAST week Dr. Farquharson asked the President of the Board of Trade whether he was aware that much dissatisfaction existed among scientific men as to the sufficiency of the tests used in the mercantile marine for the detection of colour-blindness, and whether he would appoint a committee of experts to advise the Government on this important question. In reply, Sir Michael Hicks-Beach said he was sensible of the importance of the matter, and had been in communication with the Royal Society upon the subject; and he was happy to state that "that valuable institution had appointed a committee to consider the whole question of colour-blindness."

THE meetings of the Institution of Naval Architects are now being held in the hall of the Society of Arts; the chair being occupied by Lord Ravensworth, the President of the Institution. The following is the programme of proceedings:—Wednesday, March 26, morning meeting, at 12 o'clock: (1) Annual Report of Council; (2) election of Officers and the Council; (3) alteration of rules relating to election of Vice-Presidents; (4) Address by the President; the following papers were then to be read and discussed—notes on recent naval manœuvres, by W. H. White, F.R.S., Director of Naval Construction, Vice-President; the Maritime Conference, by Rear-Admiral P. H. Colomb, R.N. Thursday, March 27, morning meeting, at 12 o'clock: on leak-stopping in steel ships, by Captain C. C. Penrose Fitzgerald, R.N.; strength of ships, with special reference to distribution of shearing stress over transverse section, by Prof. P. Jenkins; steatite as a pigment for anti-corrosive paints, by Frank C. Goodall. Evening meeting at 7 oclock: on the evaporative efficiency in boilers, by C. E. Stromeyer; on the application of a system of combined steam and hydraulic machinery to the loading, discharging, and steering of steam-ships, by A. Betts Brown; the revolving engine applied on board ship, by Arthur Rigg. Friday, March 28, morning meeting, at 12 oclock: on the variation of the stresses on vessels at sea due to wave-motion, by T. C. Read; spontaneous combustion in coal ships, by Prof. Vivian Lewes. Evening meeting, at 7 o'clock: on the screw propeller, by James Howden; experiments with life-boat models, by J. Corbett.

THE Geologists' Association have made arrangements for an Easter excursion to North Staffordshire. It will last from April 3 to 8, and the head-quarters will be the North Staffordshire Hotel, Stoke-on-Trent, except on Saturday and Sunday nights, when the Association will stay at the Red Lion, Leek.

A CONFERENCE of the Camera Club, under the presidency of Captain de W. Abney, was held last week at the Society of Arts. Lord Rayleigh gave an account of instantaneous photography by the light of the electric spark. He stated that he had been experimentalizing in taking photographs of minute jets of water as from a bottle. He exhibited on the sheet, by means of the electric light, photographs of jets of water taken in less than the 100,000th part of a second. In the course of the discussion following the demonstration and explanations by Lord Rayleigh, Mr. Trueman Wood spoke of the new application of electricity to the photographic art in fixing for study natural phenomena. The chairman, in giving the thanks of the meeting to Lord Rayleigh, referred to some photographs taken in less than the 100,000th part of a second under the name of a "photographic untruth." Captain Abney dealt with the untruth of form, which photography gave when judged by light and shade, a subject which could only be explained by series of drawings on the black-board and shadows cast upon the sheet.

THE Royal Microscopical Society has received from Dr. E. Abbe, of Jena, one of the new apochromatic $\frac{1}{10}$th microscope objectives recently produced at Zeiss's optical works, Jena, under Dr. Abbe's superintendence. The aperture is the highest hitherto attained, being 1·6 N.A., whereas the highest point previously reached by Dr. Zeiss was 1·4 N.A., so that the clear gain of aperture is 20 per cent. The advantage of this increase is shown by the perfection of the images obtained in photomicrographs produced by the new objective in the hands of Dr. Henri Van Hewick, Director of the Jardin Botanique, Antwerp, specimens of whose work were exhibited at the last meeting of the Royal Microscopical Society. At this meeting it was announced that Dr. Dallinger, F.R.S., had consented to join a committee appointed by the Council of the Royal Microscopical Society, to make a special report on the new objective.

AT the fortnightly meeting of the Royal Horticultural Society, on Tuesday, M. Henri de Vilmorin, President of the Botanical Society of France, delivered a lecture on salads, mentioning that in England we neither eat nor grow so many plants for salad as in France. He dwelt upon the nutritive value of salads due to the potash salts, which, though present in vegetables generally, are eliminated in the process of cooking. He then enumerated the various plants which are used in salads in France—namely, the leaves of lettuce, corn-salad, common chicory, barbe de capucin, curled and Batavian endives, dandelion in its several forms of green, blanched, and half-blanched, water-cresses, purslane in small quantities, blanched salsify-tops of a pleasant nutty flavour, witloof or Brussels chicory, the roots of celeriac, rampion, and radish, the bulbs of stachys, the stalks celery, the flowers of nasturtium and yucca, the fruit of capsicum and tomato, and, in the south of France, rocket, picridium, and Spanish onions. Various herbs are added to a French salad to flavour or garnish it, such as chervil, chives, shallot, and borage flowers. In addition, many boiled vegetables are dressed with vinegar and oil. M. de Vilmorin then showed specimens of dandelion, barbe de capucin, and witloof, both varieties of chicory, which he recommended to the notice of English gardeners as most useful and palatable. He mentioned that from a ton to a ton and a half of witloof is daily brought to the Paris market from Brussels, where it is grown in the greatest perfection. Specimens of English salads grown in the month of March, and consisting of corn-salad, lettuce, and blanched chicory, were sent from the Marquis of Salisbury's gardens at Hatfield. Among the other exhibits was a quaint orchid (*Cœlogyne pandurata*), a native of Borneo, sent from Kew Gardens. The flower is bright green, like the colour of forced lilac-leaves, with a dull jet black blotch and lines on the lip.

AT the meeting of the Royal Botanic Society on Saturday, it was announced that the donations received included an interesting collection of seeds from the gardens of Mr. Thomas Hanbury, at Mortola, on the coast near Ventimiglia, Italy, with printed catalogues of the great variety of plants and trees from all climes growing in the garden—more than 4000 named species.

BARON DE LISSA, the pioneer planter of British North Borneo, arrived at Sandakan in January last. The official *Gazette* of British North Borneo says that the Royal Geographical

Society of Australia have forwarded to the Baron a draft for £100 towards the expenses of obtaining some information regarding the fauna and flora of Kina Balu and its neighbourhood. Baron de Lissa has placed himself in communication with the Governor on the subject, and is endeavouring to secure the services of a well-known geologist and naturalist who is residing at Sandakan.

THE following science lectures will be delivered at the Royal Victoria Hall:—April 1, an hour with the telescope, by J. D. McClure; April 15, the colours of a soap bubble, by John Cox.

IT is pleasant to turn over the pages of the handsome new edition of Darwin's famous "Voyage of a Naturalist" (Murray). The text is well printed, and no one can fail to enjoy the admirable illustrations contributed by Mr. R. T. Pritchett. In a prefatory note Mr. Murray explains that most of the views given in the work are from sketches made on the spot by Mr. Pritchett, with Mr. Darwin's book by his hand.

IN a few days the first part of a new work on the theory of determinants, by Dr. Muir, of Glasgow, will be published by Messrs. Macmillan and Co. It presents the subject in the historical order of its development, beginning with the brilliant but unfruitful conceptions of Leibnitz in 1693, and carrying the record forward to 1841, the year of the appearance of Cayley's first paper.

MR. H. A. MIERS, of the Natural History Museum, is engaged upon a text-book of mineralogy, which will be published by Messrs. Macmillan and Co.

LAST week (p. 478) we noted that at the meeting of the Royal Society of Edinburgh, on February 28, Dr. John Berry Haycraft had communicated the results of some recent investigations on voluntary muscular contraction. Dr. Haycraft's observations are interesting both to physiologists and to physicists. Where a muscle is stimulated by an electrical shock, all the fibres of the nerve receive the same stimulus, and all the fibres of the muscle to which the nerve passes contract together, and in the same way. This is not the case when a muscle contracts on receiving a natural nerve stimulation, starting either as a result of volition or of reflex action. The central nervous system seems unable to affect all the fibres of a muscle, through the numerous nerve fibres passing to it, in such a manner that they all shall contract exactly in the same way. The reason for supposing this to be the case is the fact, observed by the author, that fascicular movements are always present within a muscle during a voluntary or a reflex contraction, so that tracings taken from different parts of the same muscle invariably differ from each other. The experiments were conducted both upon the human masseter and the gastrocnemius muscle of the frog. These fascicular movements occurring within it will prevent any muscle from pulling with perfect steadiness on any lever or other registering apparatus, and the tracings taken by means of such apparatus will show oscillatory waves, often very rhythmical in their appearance. Many observers have concluded from an examination of these tracings that they indicate that the central nervous system discharges impulses into the muscle at a rate corresponding with that of the oscillations observed. Thus some observers find 20, others 10 oscillations per second in the muscle curve, and they consider that the nervous system discharges into the muscle at these rates. The author finds that the fascicular movements just described as occurring within the muscle itself account fully for the oscillations seen, the irregular aperiodic movements of the muscle compounding themselves with the period of oscillation proper to the registering apparatus itself, for by varying the instruments used, the resultant curves may be varied at will, slow oscillations appearing when using instruments of slow period, quick oscillations when using instruments of quick period. The author suggests that these fascicular movements probably account for the production of the muscle sound, which Helmholtz long ago pointed out was chiefly an ear-resonance sound. This, of course, could readily be evoked by any slow aperiodic movement, and the fascicular movements within the muscle must at any rate assist in producing it. These fascicular movements may, perhaps, account for the results obtained by Lovén, with the capillary electrometer, for it is more probable that he was registering the period of his own instrument than that the muscles were twitching at the slow rate of 8 times per second. If these conclusions are correct, there remains little to be said in support of the theory generally accepted that the nervous system normally discharges nerve impulses into the muscles like shots quickly fired from a revolver. It may be that this is the case, but the subject requires more extended investigation before any definite conclusions can be arrived at.

THE St. Petersburg Academy of Sciences has issued the Report for 1889, which was read at the annual meeting on January 12. The Report contains a valuable analysis of the scientific work done by the members during the year. In mathematics, Prof. Tchebysheff's applications of simple fractions to the investigation of the approximate value of the square root, and M. Ishmenetsky's work on the integration of symmetrical differential equations, are especially worthy of note. In astronomy, we notice O. A. Backlund's researches on the influence of temperature upon refraction. In physics, M. Khwolson made an attempt at a mathematical investigation of the extremely complicated laws of dispersion of light in milk-coloured glasses. The exploration of earth magnetism has made marked progress, both as regards the theory of diurnal variations and the measurement of magnetical elements in Caucasia and Siberia. Besides theoretical work in meteorology, the Central Physical Observatory has extended its system of weather-forecasts. Much interesting work has been accomplished in geology, Baron Toll having brought out the first volume of the geological part of the work of the expedition to the New Siberia Islands. In the botanical department the chief event was the publication of two parts of Prof. Maximowicz's description of the plants brought from Central Asia by Przewalsky, as well as the flora of Western China, as represented in the valuable collections brought by M. Potanin. Highly interesting work was done in zoology by Prof. Famintzyn.

WHEN the sun sets in the sea, a curious appearance, as of a bluish-green flame, is sometimes observed. This has been thought to be due to the light passing through the crests of waves. But Prof. Sohncke (*Met. Zeits.*) considers this view disproved by such an observation as that recently made by Prof. Lange at a watering-place on the Baltic. Shortly before sunset, the disk was divided in two by a thin strip of cloud; and just as the upper part disappeared under the cloud, the blue flame was observed. Thus the cause appears to be in the air, not in the sea. It is a case of atmospheric refraction. And as a planet, seen near the horizon with a good telescope, appears drawn out into a spectrum, with the more refracted blue-violet end higher than the red, so the last visible part of the sun furnishes the blue-violet end of a spectrum. But it would be interesting, Herr Sohncke remarks, to determine more precisely the conditions of this not very frequent phenomenon. Perhaps it requires merely great transparency of air, as only in this case would the last ray be able to give a spectrum sufficiently intense in its blue region.

THE Report of the Meteorological Council for the year ending March 31, 1889, has been published, and describes the work of the Office under three heads. (1) Ocean Meteorology. The number of logs received from ships was 189; of these 80 per cent. were classed as "excellent," being a greater percentage of excellence than has been reported for some years. The discussion of the meteorology of the Red Sea is still in progress, and the work is well advanced. Charts of barometrical pressure for four representative months for the various oceans have been issued, together with charts showing the mean barometrical pressure for the year, and the extent of range of irregular fluctuations, and considerable progress has been made in the construction of the current charts for the various oceans. As these works are cleared off, it is intended to undertake a discussion of the meteorology of the region from the Cape of Good Hope to New Zealand. (2) Weather Telegraphy. The work of this branch continues to increase, and the Daily and Weekly Weather Reports, in particular, have been extended and improved. Forecasts continue to be prepared three times daily, and special forecasts were issued during the hay-making season; the highest percentage of success of the latter was in the southern part of England, and the lowest in the north-east district. Storm warnings are issued to those places on the coast that desire to receive them. (3) Land Meteorology of the British Isles. The records from the Observatories and Stations of the Second Order are discussed and published. The Council have continued the annual grant of £100 towards the expenses of the Ben Nevis Observatory, and have received copies of the observations made there. They have also agreed to allow £250 a year to the proposed Observatory at Fort William, for five years, and to supply an outfit of an Observatory of the First Order, to be equipped with self-recording instruments. The Report also contains interesting notes on some results of an examination of the Atlantic charts published by the Office, and on the measurement of squalls shown on the traces of Robinson's anemometers.

A NEW alkaloid, to which the name taxine is applied, has been extracted and isolated by Drs. Hilger and Brande, of Erlangen, from the leaves, seeds, and young shoots of the yew tree (*Taxus baccata*). Lucas some time ago pointed out the existence of a narcotic partaking of the nature of an alkaloid in the yew tree, and Marmé has since described a mode of extracting it. Drs. Hilger and Brande have lately prepared large quantities of this alkaloid, and have at length satisfactorily determined its composition and its more important chemical properties. The leaves and seeds were first repeatedly treated with ether in order to extract as much of the alkaloid as possible. The extract was then subjected to distillation to remove the ether, and the residue agitated with water acidified by a little sulphuric acid. The acid washings were noticed to be strongly coloured, and this was found to be due to the high tinctorial power of a compound of taxine with sulphuric acid. The acid solution was then rendered alkaline by ammonia, and the precipitated alkaloid dried over sulphuric acid. After dissolving in ether, re-washing with acid and precipitating with ammonia several times, the alkaloid was obtained as a perfectly white powder of extremely bitter taste, and melting at 82° C. On heating in a glass tube the melted taxine partly sublimes as a white cloud which condenses in the colder part of the tube in the form of drops of oil which solidify on cooling. At the same time it evolves a most characteristic odour. It is very difficultly soluble in water, chloroform, or benzene, but readily in alcohol and ether. Concentrated sulphuric acid produces an intense purple coloration. Dilute acid solutions give precipitates with gold chloride, platinum chloride, and picric acid, and also even in very dilute solutions yield precipitates on the addition of caustic alkalies or ammonia insoluble in excess. Analyses show that the formula of taxine is most probably $C_{37}H_{52}O_{10}N$. It forms with acids salts readily soluble in water. The hydrochloride, sulphate, acetate, oxalate, and tartrate, have been prepared, likewise the double salts with the chlorides of platinum and gold. The hydrochloride is best obtained by passing hydrochloric acid gas through a solution of taxine in anhydrous ether, when the salt is at once deposited in good crystals. Analysis indicates the formula $C_{37}H_{52}O_{10}N.HCl$. The sulphate possesses the composition $(C_{37}H_{52}O_{10}N)_2H_2SO_4$, the platinochloride $(C_{37}H_{52}O_{10}N.HCl)_2PtCl_4$, and the aurochloride $(C_{37}H_{52}O_{10}N.HCl)AuCl_3$. A compound of taxine with ethyl iodide, of the composition $C_{37}H_{52}O_{10}N.C_2H_5I$, was also obtained by heating equal molecules of the alkaloid and ethyl iodide to 100° C. under pressure. This compound is also a crystalline solid soluble in water. As regards the constitution of the alkaloid, which from its high molecular weight must of necessity be extremely complex, it has only yet been ascertained that it belongs to the class of nitrile bases. The leaves of the yew tree were found to contain the largest quantity of taxine, the seeds containing a smaller but still by no means inconsiderable quantity of the alkaloid.

THE additions to the Zoological Society's Gardens during the past week include a Rhesus Monkey (*Macacus rhesus* ♀) from India, presented by Mr. McDowall Currie; a Ring-necked Parrakeet (*Palæornis torquatus* ♂) from India, presented by Miss Thornton Smith; two West African Love Birds (*Agapornis pullaria* ♂ ♀) from West Africa, presented by Mrs. Cyril Tatham; a Black-necked Stork (*Xenorhynchus australis*) from Malacca, two Peacock Pheasants (*Polyplectron chinquis* ♂ ♀) from Burmah, purchased.

OUR ASTRONOMICAL COLUMN.

OBJECTS FOR THE SPECTROSCOPE.

Sidereal Time at Greenwich at 10 p.m. on March 27 = 10h. 21m. 7s.

Name.	Mag.	Colour.	R A. 1890.	Decl. 1890.
			h. m. s.	° ′
(1) G.C. 2102	—	Blue.	10 19 29	−18 5
(2) 37 Leonis	5·7	Yellowish-red.	10 10 47	+14 17
(3) γ Leonis...	2	Yellowish-white.	10 13 54	+20 24
(4) α Leonis...	1	White.	10 2 30	+12 30
(5) 136 Schj.	6	Very red.	10 46 17	−20 46
(6) X Boötis...	Var.	Dull orange.	14 18 59	+16 49

Remarks.

(1) This is a very bright planetary nebula in the constellation Hydra. From its size and equable light, Smyth compared it to Jupiter. It is about 32″ in diameter, and its spectrum consists of bright lines. In 1868, Dr. Huggins recorded the presence of the three characteristic nebula lines, but Lieutenant Herschel only saw two of them. The spectra of planetary nebulæ are by no means difficult to observe, notwithstanding their generally small diameters. If no cylindrical lens be employed, the lines in some cases are considerably bright, and their shortness is no great drawback. Now that we know that there are a good number of lines in the nebula of Orion, it seems reasonable to expect that a careful search will reveal a greater number in other nebulæ. D_3 and a line about λ 447 are the next in order of brightness to the three chief lines and G in the visible part of the spectrum of the nebula in Orion, and these should therefore be first looked for. It should also be particularly noted whether the brightest line is perfectly sharp on both edges, or otherwise.

(2) This star has a spectrum of the Group II. type. Dunér states that the spectrum is rather feebly developed, all the bands being narrow. The bands 2 and 3 in the red are the strongest. The character of the spectrum indicates that the temperature of the star is probably higher than that of most of the members of the group, the spectrum approaching that of Aldebaran. In that case, a considerable number of lines may be expected. It will be remembered that in Aldebaran there is mainly a line spectrum, together with the remnants of the bands in the red.

(3) A star of the solar type (Gothard). The usual observations are required.